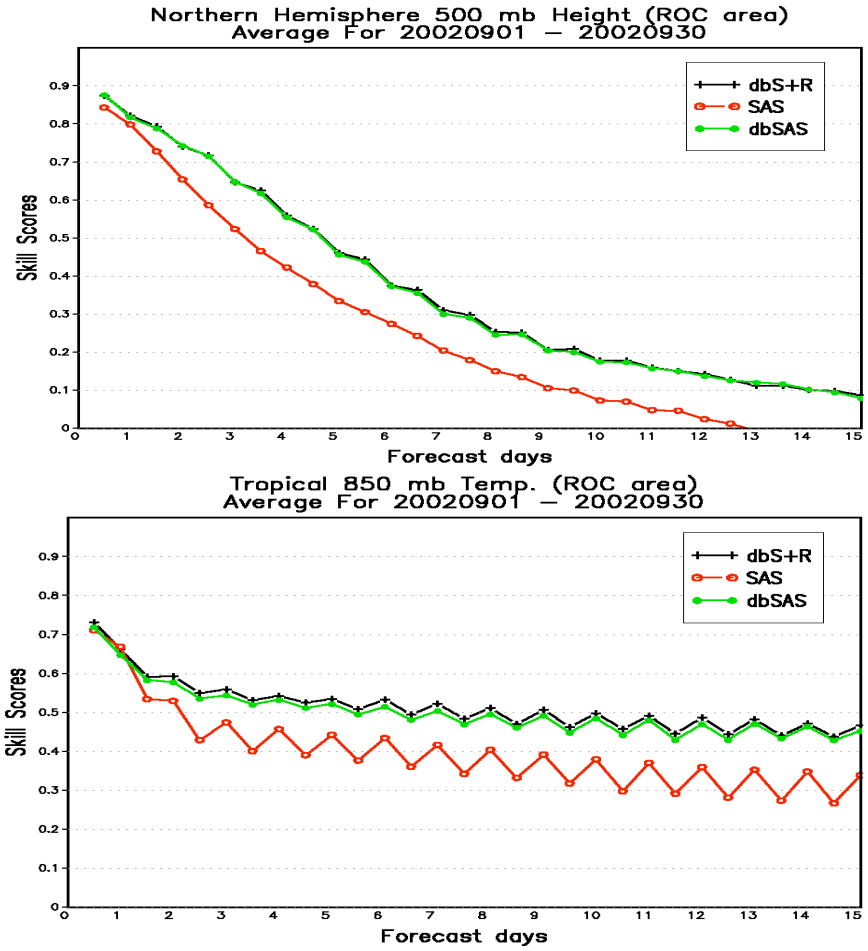

Fig.1. ROC area of probabilistic forecast based on SAS (red), bias corrected SAS (green) and a dual version (SAS and RAS, bias corrected) ensemble SRSRS (black) for 500hPa height over northern hemisphere (upper panel) and 850hPa temperature over the tropics (lower panel). It can be seen that ensemble based probabilistic forecast can be improved (ROC area increased) by bias correction (compare red and green), but not by using multi-model version ensembles (compare green and black).

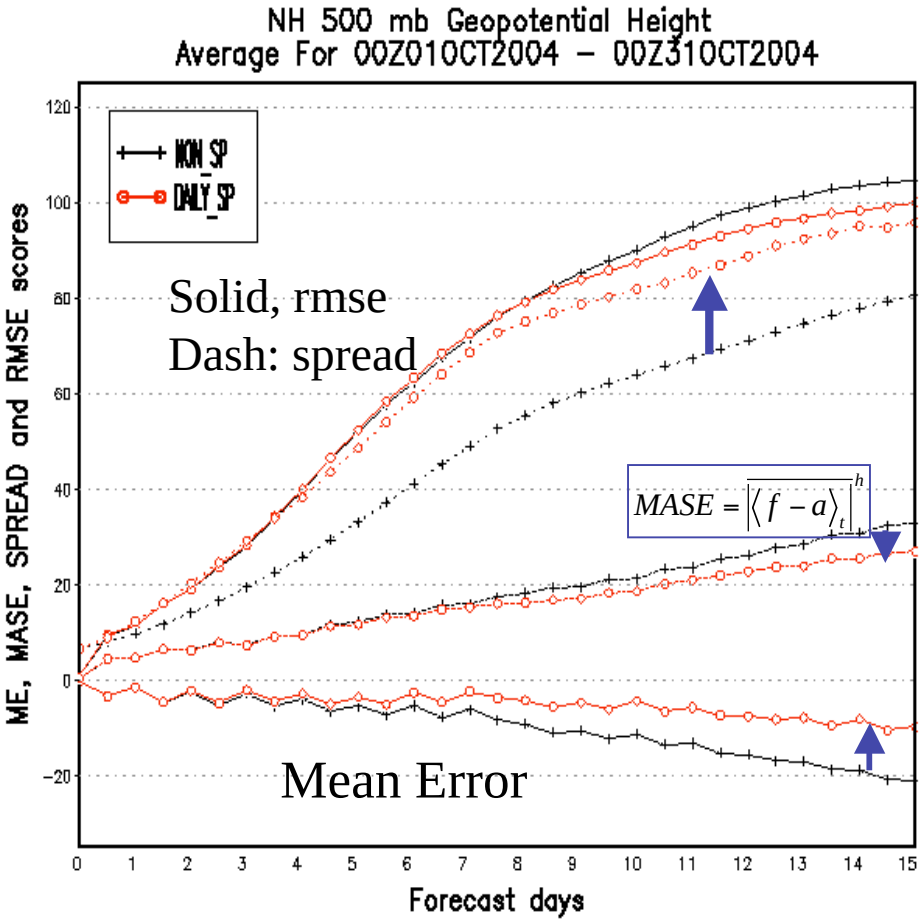

Fig.2 Regional Mean Error, MASE, Ensemble Spread and RMSE of ensemble mean forecast with the Stochastic Perturbation scheme (red) and without it (black). The blue arrows indicate the increase in spread and reduction in ME and MASE.

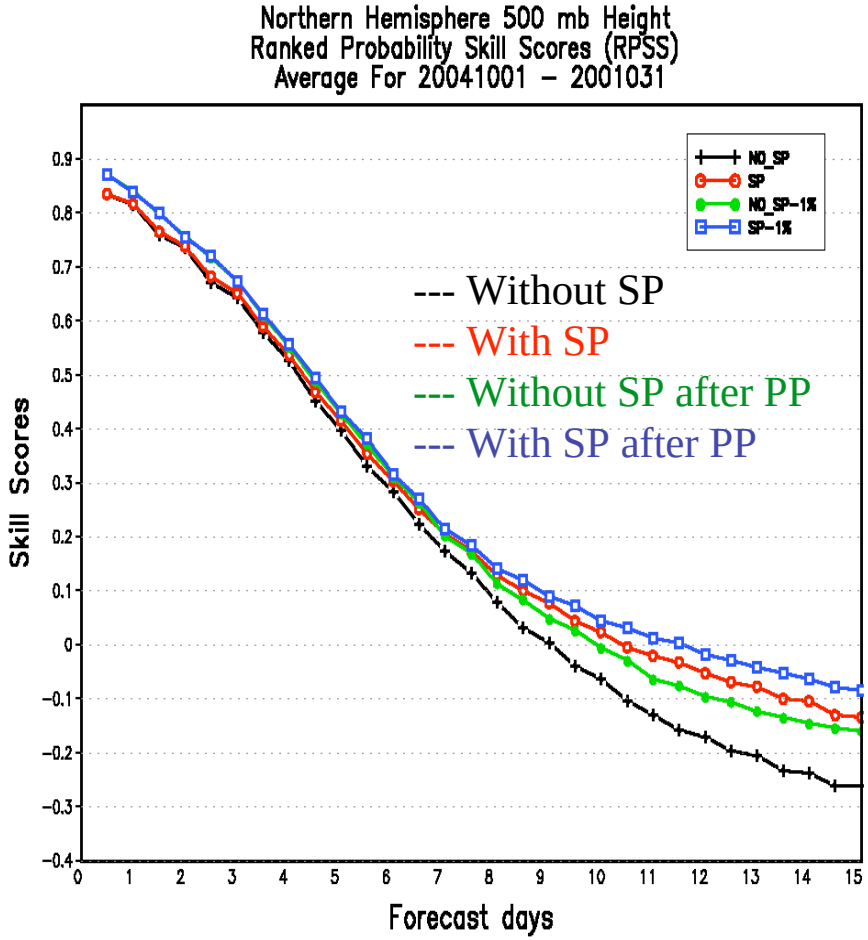

Fig3. NH average Ranked Probability Skill Score (RPSS) for ensemble forecasts with the Stochastic Perturbation scheme (red) and without it (black), with the green and blue lines representing the scores after removing the mean bias.